Your Prosody Matters! The Effect of Controlling Tone of Voice on Listeners' Experienced Pressure, Closeness, and Intention to Collaborate with the Speaker

Your Prosody Matters! The Effect of Controlling Tone of Voice on Listeners' Experienced Pressure, Closeness, and Intention to Collaborate with the Speaker

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Abstract

According to Self-Determination Theory, speakers can communicate with listeners either in more controlling or in more autonomy-supportive ways. Whereas most previous studies focused on the lexical-semantics (i.e. words) of both communication styles, the current research examined whether experimentally induced controlling versus autonomy-supportive tone of voice differentially predicts listeners' experienced pressure, closeness, and intentions to collaborate, even when listeners are exposed to these communications only briefly. In two experimental studies (Study 1, $N = 61$; $M_{age} = 31.51$; Study 2, $N = 111$; $M_{age} = 44.73$), multilevel analyses indicated that voice quality is the most critical parameter distinguishing between controlling and autonomy-supportive prosody. That is, sentences spoken with a harsher, relative to a softer, tone of voice were perceived as more pressuring (Studies 1 and 2), with higher levels of experienced pressure following harsh voices explaining why listeners felt less close to and anticipated less intent to collaborate with controlling speakers (Study 2). Study 2 applied these principles in the parenting context and shed further light on the robustness of these findings by examining whether the tone of voice effect occurs regardless of the target of the communication (i.e., parents themselves or their children) and interacts with parents' authoritarianism and causality orientation. Despite a few significant interactions, a vast majority of listeners interpreted controlling prosody more negatively than autonomy supportive prosody. The discussion focuses on how controlling tone of voice interferes with listeners' motivation.

Keywords: Prosody; Motivation; Self-determination theory; Authoritarianism; Causality orientations

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Teachers asking their students to stop interrupting a classroom lecture, managers requesting a report by the end of the day, or parents asking their children to get dressed and out the door: everyday life is replete with brief but powerful interactions in which a speaker tries to direct the behavior of a listener. To this end, speakers can rely on different motivational practices. According to Self-Determination Theory (SDT; Ryan & Deci, 2017), a broad theory on human motivation, these practices can vary in their level of control relative to autonomy support and this variation is consequential for listeners' perceptions and functioning. When listeners are approached in an autonomy-supportive way, speakers empathize with and support listeners' interests, preferences, and values, which enhances their experience of free choice, volition, and self-endorsement of their actions. In contrast, when speakers motivate their listeners in a controlling way, they put pressure on them to act, think, or behave in speaker-prescribed ways and, hence, reduce listeners' sense of free choice (Grolnick & Ryan, 1989; Ryan & Deci, 2017; Soenens & Vansteenkiste, 2010).

Recent research has begun to show that, in addition to the words used by speakers (e.g., "you may" vs. "you should"; Reeve & Jang, 2006; Ryan, 1982; Vansteenkiste et al., 2004), autonomy-supportive or more controlling communication can be differentiated on the basis of speakers' tone of voice (Weinstein et al., 2019, 2020). In the present study, we adopted a fine-grained approach by examining, for the first time, whether a single sentence spoken in a controlling (as opposed to an autonomy-supportive) tone of voice (or prosody) could shape listeners' perceptions of speaker pressure, felt closeness to, and intentions to collaborate with the speaker, and which acoustic dimension in the voice might be responsible for such effects. Because no prior study has looked at potential moderators, we also examined whether the expected effects of motivational prosody would generalize across targets and

across individual differences in listeners' authoritarianism (Altemeyer, 1983) and general causality orientations (Deci & Ryan, 1985a), two dispositional variables that may affect the degree to which people consider controlling communication to be normative and appropriate.

Autonomy-supportive and Controlling Socialization

In diverse interpersonal relationships (e.g., parent-child, teacher-student, employer-employee and partner relationships), speakers use different autonomy-supportive practices to address listeners (Deci et al., 1994; Reeve, 2009; Vansteenkiste et al., 2019). Autonomy-supportive speakers provide choice to listeners, stimulate their initiative and offer a meaningful rationale when making requests. Moreover, they follow listeners' rhythm in performing certain tasks, and are patient as they do so (Grolnick & Ryan, 1989; Soenens et al., 2017). In contrast, controlling speakers pressure listeners to act, feel, or think in specific ways. They do so by dismissing objections, by using threats or sanctions, or by making use of subtler controlling practices such as guilt induction or love withdrawal (Ryan & Deci, 2017; Soenens & Vansteenkiste, 2010).

Research has revealed repeatedly, across life domains (e.g., teaching, parenting, work, and romantic relationships) and across age groups, that controlling communication predicts poor quality motivation (Vansteenkiste, Zhou, et al., 2005), lower well-being (Soenens et al., 2008), less long-term persistence (Vallerand et al., 1997), and lower performance (Weinstein et al., 2010) than autonomy-supportive communication (see Bureau et al., 2022; Vasconcellos et al., 2020; Vasquez et al., 2016 for meta-analyses). Further, autonomy-supportive communication predicts a host of adaptive interpersonal outcomes, including higher attachment security (La Guardia et al., 2000), greater emotional reliance on others for support (Deci et al., 2006) and more voluntary disclosure of personal information between parent and child (Wuyts et al., 2018). Such findings have been obtained using both cross-sectional (Soenens & Vansteenkiste, 2010), longitudinal (Duineveld et al., 2017), diary-based (Van der

Kaap-Deeder et al., 2017) and experimental (Reeve & Tseng, 2011; Vansteenkiste et al., 2004) methods, and making use of both self-report measures and observations (Bindman et al., 2015) of autonomy-supportive and controlling behaviors.

Autonomy-supportive and controlling communication styles differ not only in terms of conversation practices used by speakers (e.g., giving choice and providing a rationale versus relying on threats), but also in terms of the lexical-semantics of the communicated message. That is, the words speakers use can vary in terms of their level of conveyed choice relative to control (Reeve, 2009). Hence, the meaning attributed to the message can be more informational or more pressuring (Deci & Ryan, 1985a; Ryan & Deci, 2020). Specifically, autonomy-supportive speakers more often make use of inviting (e.g., "I propose"; "I ask"), suggestive (e.g., "You may…"; "You could …") or descriptive (e.g., "I notice") language. By contrast, controlling communication involves the use of more forceful (e.g., "You have to") and evaluative (e.g., "Good children should do X") language and commands (e.g., "Do this!"). Previous studies, both observational and experimental in nature, have shown that whereas controlling language impacts negatively on intrinsic motivation (Mabbe et al., 2018; Ryan, 1982) and conceptual learning (Grolnick & Ryan, 1987; Vansteenkiste, Simons, et al., 2005), autonomy-supportive language promotes autonomy need satisfaction (Baten et al., 2020), positive affect and motor skills learning (Hooyman et al., 2014) and perseverance (De Muynck et al., 2017; Vansteenkiste et al., 2004).

Autonomy-supportive and Controlling Tone of Voice

Alongside the words communicated, the way in which these words are delivered may also differ in its level of conveyed autonomy support relative to control. That is, the paraverbal aspects of a speaker's message, and specifically, the tone of voice or prosody, may impact whether a message is perceived as more controlling and pressuring or more informational and autonomy-enhancing. Tone of voice can be operationalized through

different acoustic parameters, including the low- or highness (i.e., pitch), sharpness or harshness as an indicator of voice quality (as measured via the distribution of energy in high-frequency energy bands), volume (i.e., intensity or amplitude) and speech rate (i.e., duration) of one's utterances (e.g., Banse & Scherer, 1996).

A couple of previous studies using both experimental designs (Weinstein et al., 2020; Weinstein et al., 2018) and more ecologically valid methods (Paulmann et al., 2018), analyzed speech patterns of speakers in terms of acoustics, and found that controlling, relative to autonomy-supportive, prosody is characterized by increased energy in higher frequency bands of the voice signal, resulting in a harsher-sounding voice. Pitch, amplitude and duration were shown to covary with an increase in vocal energy for controlling messages, yet the direction of these effects varied across studies (Paulmann et al., 2018; Weinstein et al., 2020; Weinstein et al., 2018).

Similar to the way motivational words impact listeners' emotional and motivational functioning, listeners have been found to respond differently to controlling and autonomy-supportive prosody. When compared with a neutral tone of voice, autonomy-supportive tone of voice led to more positive and less negative affect, increased closeness and more cooperation and effort in adolescents, whereas listening to a controlling tone of voice undermined these outcomes compared to a neutral tone condition (Paulmann & Weinstein, 2023; Weinstein et al., 2019). Moreover, experimentally induced controlling tone of voice elicited more pressure than autonomy-supportive tone of voice, which helped to explain why listeners reported being more likely to defy controllingly communicated messages (Weinstein et al., 2020).

What remains unclear from this emerging literature on motivational prosody is whether relatively short exposure to controlling or autonomy-supportive prosody has an effect on listeners. That is, the question can be raised whether a single sentence spoken with a

controlling tone of voice suffices to generate different experiences in listeners. This is important to explore given the prominence of short interactions in daily life: for example, speakers can address listeners with a single sentence such as: “Set the table before the guests arrive!” to activate them, and the manner in which such a sentence is conveyed might impact whether listeners respond positively or negatively to the given request. Moreover, speakers may alter their tone of voice when making several, or repeated requests such as when instructing children to “brush your teeth” or “comb your hair”, thereby potentially eliciting different reactions in listeners at each exchange. Moreover, it is not clear whether individual specific acoustic parameters or a combination of them are involved in this effect. As no studies to date have looked at acoustic cues as predictors of responses in the listener, we will test which perceptual cues (e.g., pitch, loudness, speed, harshness) play the most prominent role in this process.

Also, to investigate whether exposure to controlling or autonomy-supportive prosody has unique effects, above and beyond the effects of the lexical-semantics of the communicated sentence, two potentially confounding factors were considered in this study. Specifically, we examined the type of sentence (i.e., command vs. suggestion vs. statement) and the valence of the targeted behavior (i.e., whether requests target desired vs. undesired behaviors). We considered the possibility that commands, given their directive orientation, would be experienced as more pressuring, while suggestions, given their propositional nature, would not, irrespective of the tone of voice in which they were communicated. Also, requests targeting desired behaviors (e.g., “Let’s give his snack back”) may be perceived as less pressuring than those prohibiting undesired behaviors (e.g., “I don’t like you doing that”) irrespective of tone of voice.

Potential Moderators of a Controlling Tone of Voice Perception

Although research has begun to demonstrate the effects of prosody on listeners' motivation and experiences, it is not clear whether all listeners are equally susceptible to these effects. The extent to which listeners are sensitive to the effects of a controlling tone of voice may depend on the perceived normativity (Ajzen, 1991; Reeve et al., 2014) of such a communication style (Ajzen, 1991; Gershoff et al., 2010; Lansford et al., 2018; Reeve et al., 2014). Thus, we considered the possibility that listeners who consider the use of a controlling tone of voice to be a more common practice (i.e., because of personality-level tendencies towards controlling motivations) may be less likely to differentially respond to an autonomy-supportive versus controlling tone of voice. The issue of normativity was approached in this study from three different angles, with one moderator reflecting a characteristic of the target of the motivational message (i.e., whether the target is an adult or a child) and with two other moderators reflecting characteristics of the listener, that is, whether the listener is control- or autonomy-oriented and endorses an authoritarian attitude.

When assessing the effect of controlling, relative to autonomy-supportive, prosody, the age of the targeted person may be important. Because the use of a controlling tone of voice may be seen as a more normative practice among toddlers, relative to adults, one may perceive the effect of a controlling tone of voice as less harmful for toddlers. Previous research has indeed shown that parental controlling practices, like spanking, are more common among 2 to 5 years old (Finkelhor et al., 2019; Perrin et al., 2023; Straus & Stewart, 1999) and are even perceived by some parents as necessary and appropriate (Baumrind, 1996, 1997; Larzelere, 1996) disciplinary practices at that age (see (Gershoff, 2002) for a meta-analysis). Moreover, Grusec and Davidov (2010) argued that parents' socializing role implies that in certain situations, parents have the task to inhibit impulses in children, to sanction them for inappropriate behavior, and to enforce rules and obtain compliance, making it, according to the authors, normative or even desirable to use controlling practices. As such,

controlling practices may be more effective than more permissive ones in such contexts. As this socializing role is rather unique to the adult-child relation and applies not to relationships among adults themselves, the use of a controlling style, and a controlling tone of voice, may be perceived as more appropriate and, hence, less harmful in adult-child, relative to adult-adult interactions.

Further, individual differences between listeners in their habitual way of regulating their behavior might influence the perception of controlling prosody. Within SDT, these interindividual differences have been referred to as causality orientations, with different orientations reflecting qualitatively different ways of initiating and regulating one's behavior across life domains (Deci & Ryan, 1985a). When control-oriented, people typically base their behavior on internal or external pressures, norms, and constraints, while autonomy-oriented individuals' behavior is more driven by their interests, values, and preferences (Koestner & Levine, 2023; Vansteenkiste et al., 2010). Importantly, parents with a more autonomous orientation were found to provide more autonomy-support to children (Deci & Ryan, 1985a), while teachers high on the controlled orientation were observed to use a more controlling teaching style (Van den Berghe et al., 2013). It could be that, in a similar fashion, parents high on the controlled orientation will deem the use of a controlling tone of voice more appropriate and therefore less detrimental than parents high on the autonomous orientation, who will preferentially use and respond to autonomy-supportive prosody.

Further, authoritarianism is another potential moderator because this orientation is typical of individuals who strongly value obedience, conformity, and submission to authority (Adorno, 1950; Altemeyer, 1983), values that are typically conveyed through more controlling and less autonomy-supportive communication styles. People high on authoritarianism indeed endorse more positive attitudes toward controlling and authoritarian parenting practices (Danso et al., 1997; Duckitt, 2001; Peterson et al., 1997). Very likely

then, an authoritarian attitude is related to greater perceived normativity of controlling communication (see Reeve et al., 2018), with individuals high on authoritarianism therefore being less sensitive to controlling prosody.

The Present Research

The main aim of the current set of experimental studies was two-folded. First, we explored whether short communications spoken in a controlling or autonomy-supportive way, as expressed through varying acoustic cues in the voice, might differentially impact the receiver's perceptions of those communications. Secondly, we tested whether those perceptions may be altered by individual differences between listeners.

To do so, Study 1 examined perceptions to a number of acoustically varying sentences conveyed in a controlling or autonomy-supportive way, and within it we considered which critical acoustic parameters are involved in these effects. In addition to a broader set of outcomes (i.e., perceived closeness and intents to collaborate), Study 2 studied potential moderators of the perception of motivational tone of voice (i.e., target, authoritarianism, causality orientations). Both studies were approved by the ethical review board from the Faculty of Psychology and Educational Sciences at Ghent University.

Study 1

In Study 1 we investigated, first, the extent to which semantically identical sentences intoned in autonomy-supportive and controlling ways were perceived as pressuring. Second, we explored which specific acoustic cue, that is, harshness, loudness, speed or pitch, might be of interest in explaining the expected difference in felt pressure. We hypothesized that sentences spoken with a controlling tone of voice would be perceived as more pressuring than autonomy-supportive prosody, with this effect being primarily driven by the voice quality indicator (i.e., increased high-frequency energy).

Method

Participants. Sixty-one native Dutch speaking participants were recruited via Prolific Academic (Peer et al., 2017) for an online survey. Sample size was determined based on previous research (e.g., double the size as in Weinstein et al., 2018). Fifty-one percent was female and 25% reported to have children. Participants' age ranged from 19 to 76 years old (M = 31.51 years, SD = 13.62). Participants provided informed consent.

Experimental stimuli. Stimuli were developed in collaboration with two professional actors (one male, one female) with experience in improvisation theater. Actors were given two paper bundles, both containing 26 semantically identical sentences. One bundle instructed the actors to "speak the following sentences in an autonomy-supportive way"; the other bundle instructed them to utter them "in a controlling way". Similar to procedures outlined by Weinstein et al. (2018), actors were informed about the practices and outcomes of controlling and autonomy-supportive motivations prior to recording but were not instructed on how to intone these two different motivating styles. Instead, they were instructed to speak in a way that felt natural to them and were asked to avoid sounding angry or happy. Sentences were divided into four groups following Social Domain Theory (i.e., Neutral, Moral, Prudential, Personal; Smetana, 2006), each preceded by a domain-specific contextual description (e.g., in the prudential domain, the following information was provided: "It's 4 PM when your child is craving a snack. When you follow your child to the kitchen, you see s/he is eating biscuits. You want him/her to eat a piece of fruit instead. Please motivate your child to do so in a controlling/supportive way."), making it easier for actors to empathize with the given situation and to intone the sentences in a lifelike way.

Recordings took place in a sound attenuated room in which speakers sat at an equal distance from a high-quality microphone during recordings for each type of prosody; actors were asked to repeat the sentence until they were satisfied with the result. After recordings,

one sentence was dropped because one actor had added a word that was not in the materials, leaving us with 25 sentences in total.

A variation of different lexical-semantic items were presented, with sentences involving commands (e.g., “Eat your own snack”; $n = 10$), suggestions (e.g., “Let’s give his snack back”; $n = 6$) or statements (e.g., “I don’t like you doing that”; $n = 8$). One sentence could not be clearly categorized into one of these categories and was therefore dropped, leaving us with 24 sentences in total (see Appendix A). Also, sentences pointed towards the engagement in desired behaviors (e.g., “Let’s give his snack back”; $n = 16$), while others involved the prohibition of undesired behavior (e.g., “I don’t like you doing that”; $n = 8$).

Sentences were presented in randomized order to participants in semantically identical pairs across motivational prosody conditions and counterbalanced for type of prosody used (i.e., controlling and autonomy-supportive). Participants listened to sentences intoned by the same-sex actor.

Measures. After each sentence, participants rated how the speaker sounded on a rating scale from 1 (*not at all true*) to 7 (*absolutely true*) (see Weinstein et al., 2020). Specifically, participants indicated for each sentence how pressuring (i.e., ‘The speaker sounds bossy’) and how supportive of choice (i.e., ‘The speaker supports a sense of choice’) the speaker sounded. Given the strong negative correlation ($r = -.65$, $p < .001$) between experienced pressure and felt choice at the within-person level, a composite *perceived pressure* score was created by subtracting the felt choice from experienced pressure (i.e., ranging from -6 to +6; the higher the score, the more pressure was perceived). Results for experienced pressure and felt choice are presented separately for Study 1 in Appendix B.

Analytic strategy. As a manipulation check between both types of sentences (i.e., controlling versus autonomy-supportive prosody), four acoustic parameters for the 24 selected sentences were extracted with customized scripts using *praat* software (i.e., pitch in

hertz, amplitude in decibels, duration in seconds and high-frequency energy in decibels (Boersma & Weenink, 2023). We compared both types of prosody in terms of these parameters using a linear regression model, as we also controlled for the gender of the speaker.

Before conducting the main analyses, the sociodemographic variables age, gender, and number of children were tested in prediction of the current study variable *perceived pressure*. This was done using a linear mixed regression model, allowing the model to control for the dependent variance within the outcome. Indeed, the current design resulted in nested sentences within participants, a statistical issue we verified by calculating the Intra-Class Correlation (ICC). This indicates the proportion of between-subject variance, relative to the within-subject variance, which provides more evidence for a multilevel structure when being higher. In the current modelling, continuous variables were centered. In the presentation of the upcoming analyses, we both report *p*-values to test for statistical significance and the partial eta-squared (η^2_p) for practical significance, being interpreted as small when $\eta^2_p < .01$, medium when $\eta^2_p > .01$ and $< .06$ and large when $\eta^2_p > .06$ (Cohen, 1992). When more than one predictor is included, multicollinearity was checked by the Variance Inflation Factor (i.e., VIF < 4 indicates no multicollinearity). Finally, the proportion of variance explained by predictors in the model is reported via the marginal and conditional R^2 (marginal R^2 for variance explained by fixed effects**,** conditional R^2 for variance explained by fixed and random effects).

After preliminary analyses, non-significant covariates were removed from the model. Then, linear mixed regression modelling was used to test how both types of prosody (as a within-subject predictor) were perceived as more or less pressuring. Subsequently, we tested the robustness of this prosody effect by including the lexical-semantic meaning of the sentences in two separate models. Specifically, classifications were made based on type of

language in the first model, with commands serving as the reference category in contrast to suggestions and statements and valence of the targeted behavior in the second model, with desired behavior serving as the reference category in contrast to undesired behaviors. Analyses were conducted in R Studio (R Core Team, 2021) from which the syntax is available on our OSF project page [https://osf.io/24ukq/].

Results

Manipulation check. Table 1 provides the descriptive statistics and t-tests of between-condition effects for each acoustic dimension. Controlling for gender of the actor, significant effects were found for amplitude and voice quality, while no effects were found for pitch and duration. Voice quality had the largest effect size. This indicates that sentences were spoken more loudly as well as with increased harshness (as indicated through increased high-frequency energy) in the controlling, compared to the autonomy-supportive condition.

Primary analyses. Unconditional models to assess intraclass correlation (ICC) showed that for experienced pressure, 23% of the variance in listeners was situated at the between, rather than at the within-person level. As part of the preliminary analyses, no unique effects for the sociodemographic variables were found (all p's > .05). Next, findings from the linear mixed regression model indicated that overall, sentences spoken with a controlling tone of voice were perceived as significantly more pressuring (M = 2.64) than sentences spoken with an autonomy-supportive tone of voice (M = -.77) (β = .55, t(2856.04) = 38.45, p < .001).

To investigate which acoustic parameter drove this effect, all four acoustic indicators (i.e., pitch, amplitude, voice quality and duration) were introduced simultaneously in a linear mixed effects model, whilst controlling for speaker gender. Results showed a main effect of voice quality (β = .38, t(2853.03) = 17.85, p < .001), amplitude (β = -.11, t(2853.07) = -4.82, p < .001) and duration (β = -.15, t(2853.10) = -4.82, p < .001) on ratings of experienced pressure. This indicates that the harsher, the quieter and the faster speakers sounded, the more

pressuring they were perceived by listeners. Further, a marginally significant main effect of pitch was found, indicating that the higher actors spoke, the more pressuring they were perceived by listeners (β = .09, t(2853.05) = 1.97, p = .05).

In a next step, the robustness of the prosody effect on pressure was investigated by introducing the lexical-semantics of the sentence as a covariate in the model (i.e., type of language and valence of behavior). The main effect of prosody remained significant (β = .55, t(2853.03) = 41.80, p < .001), irrespective of the lexical-semantics of the sentence, with both type of language and valence of the behavior yielding an additional unique contribution. Specifically, commands were perceived as more pressuring than either statements (β = -.16, t(2853.04) = -10.98, p < .001) or suggestions (β = -.19, t(2853.16) = -12.34, p < .001). Sentences pointing towards undesired behavior were perceived as more pressuring than sentences pointing towards desired behavior (β = .20, t(2853.03) = 13.56, p < .001). A significant interaction between prosody and undesired behavior was found too, such that sentences pointing towards undesired behavior were perceived as even more pressuring when uttered with a controlling tone of voice (β = .04, t(2854) = 2.11, p = .03).

Brief Discussion

Three findings of Study 1 warrant a brief discussion. First, especially voice quality and to a lesser extent amplitude and duration, but not pitch, were found to be critical in distinguishing controlling from autonomy-supportive prosody. Second, sentences with such controlling prosody were perceived as more pressuring than those with autonomy-supportive prosody. That is, speakers were perceived as more pressuring when speaking with a harsher, faster, and quieter relative to a softer, slower, and louder voice. Third, the effects of prosody appeared robust as they remained significant after controlling for the role of semantics like type of language and the targeted behavior.

Study 2

Study 2 extended Study 1 in three ways. First, while experienced pressure was the only outcome in Study 1, we additionally assessed listeners' intention to collaborate with the speaker and their felt closeness to the speaker in Study 2. We expected that controlling prosody would not only be perceived as more pressuring but would also make listeners less willing to collaborate with and want to take more distance or feel less close to the speaker than autonomy-supportive prosody (Hypothesis 1). We assumed, however, that the degree to which a message was perceived as pressuring, would mediate the relationship between prosody and the intent to collaborate and felt closeness. That is, we expected that the more pressuring a message was perceived, the less participants would be willing to collaborate and be close to the speaker (Hypothesis 2). Similar to Study 1, we expected this effect to be mostly driven by the acoustic parameter of high-frequency energy. Second, we examined in a more explorative manner the robustness and generalizability of these findings by investigating whether they would equally apply for participants (i.e., who were parents) themselves as well as for children of a toddler age (i.e., from the parents' perspectives). Given that controlling practices are more prevalent in toddlers, we reasoned that the imagined impact of controlling prosody on toddlers might be less outspoken as compared to its impact on adults themselves (Hypothesis 3). Apart from varying the target of communication, we also explored the potential moderating role of a listener's causality orientation and authoritarianism, as a third extension. Specifically, we considered the possibility that individuals high on either the controlled orientation or authoritarianism may be impacted less by controlling prosody as they would be more normatively exposed and used to such controlling prosody (Hypothesis 4). Instead, parents high on the autonomous orientation may be more sensitive and, hence, could experience more negative effects following controlling prosody, while benefiting more from the positive effects of autonomy-supportive prosody (Hypothesis 5).

Method.

Participants. One hundred and eleven native Dutch speakers (50% female) were recruited via Prolific Academic (Peer et al., 2017) for an online survey. Sample size was in line with previous studies (e.g., Weinstein et al., 2019; 2020). Participants were all parents with 2.02 children on average, with an average age of 13 years old. Participants' ages ranged from 24 to 65 years old (M = 44.73, SD = 9.61). Participants provided informed consent.

Materials. The same 24 stimuli as in Study 1 were used. Again, sentences were presented in randomized order to participants in semantically identical pairs across motivational prosody conditions, counterbalanced for motivational quality of the prosody used (i.e., controlling and autonomy-supportive). Different from Study 1, participants were randomly assigned to the male or female speaker (50% each).

Measures. In Study 2, different from Study 1, the target of the communication (i.e., child or adult) was specified before participants were asked to rate the stimuli. That is, in a first step, participants were instructed to listen to the materials as if the speaker spoke to their child when she or he was a toddler. After each sentence, participants were asked to indicate on a rating scale from 1 (*not at all true*) to 7 (*absolutely true*) how bossy and supportive of choice their child would find the speaker, to what degree their child would want to cooperate with the speaker (i.e., measure of intentions to collaborate) and how close their child would want to be near the speaker (i.e., measure of closeness). In a second step, parents were instructed to now listen to 6 of the 24 sentences as if they were spoken to themselves and answer the same questions. Here, these 6 sentences were selected because they could be directed to adults and children alike in terms of lexical-semantics (see Appendix A).

Given the strong negative correlation (r = -.64, $p < .001$) between felt pressure and felt choice at the within-person level, a composite pressure score (i.e., ranging from -6 to +6) was, similar to Study 1, created by subtracting the felt choice score from the bossiness score.

Results for experienced pressure and felt choice separately for Study 2 are presented in Appendix C.

Authoritarianism. Parents completed the Dutch version (Meloen et al., 1996) of the Right Wing Authoritarianism scale (Altemeyer, 1983; e.g., "Obedience and respect for authority are among the most important virtues children should learn"). This scale consisted of 14 items and has been used and validated in previous research (e.g.,(Duriez et al., 2007)). Internal reliability was high (α = .82).

General Causality Orientation Scale. Parents filled in a 12-item Dutch version of the GCOS (Deci & Ryan, 1985a), consisting of lifelike situations operationalized in vignettes e.g., "You had a job interview several weeks ago. In the mail you received a form letter which states that the position has been filled. It is likely that you might think. . ."), followed by items tapping into their autonomous (e.g., "Somehow they didn't see my qualifications as matching their needs.") and controlled orientation (e.g., "It's not what you know, but who you know.") orientation. This scale has been validated and frequently used before (Soenens et al., 2005; Wuyts et al., 2015). Cronbach's alpha for the autonomous orientation was .63, and .64 for the controlled orientation.

Analytic strategy. A similar procedure as Study 1 was used to analyze the current set of research questions in which we first checked the role of the sociodemographic variables on the study variables before conducting the main analyses. As in Study 1, non-significant covariates were removed from the models in the main analyses. Herein, we built six linear mixed regression models for each outcome (i.e., perceived pressure, intent to collaborate, felt closeness). Similar to Study 1, we first checked the condition effect (i.e., manipulated prosody), with prosody as a within-person predictor (*Model 1;* Hypothesis 1). To study which of the acoustic indicators would be driving the prosody effect, we also performed this model with pitch, amplitude, voice quality and duration as separate predictors (*Model 1b*). To test

Hypothesis 2, we built a multilevel mediation model using the package 'lavaan' (Rosseel, 2012) to investigate whether the degree to which listeners would want to collaborate and feel close to the speaker would be mediated by how pressuring the speaker is perceived. As the model is saturated, no fit indices are reported. However, to evaluate the fit of the model, R^2 is reported for each outcome.

Next, we examined the main effects of target, authoritarianism and, autonomous and controlled orientation on all outcomes in *Model 2*, before checking for their moderating roles through a series of stepwise analyses. In *Model 3*, prosody, target and prosody by target were introduced as predictors at the within-person level, while controlling for gender at the between-person level. Then, in *Models 4a* through *4c*, a different between-person predictor (authoritarianism in *Model 4a*, controlled orientation in *Model 4b* and autonomous orientation in *Model 4c*) was entered at the between-person level, with a cross-level interaction between the between-person predictor and prosody being additionally added to examine its moderating role. In each model, participants were included as random effect and we checked models for multicollinearity and their proportion of explained variance (i.e., marginal and conditional R^2). For the sake of clarification, we visualized significant two-way interactions including standardized simple slope coefficients. Similar to Study 1, supplementary analyses were performed to assess the robustness of prosody effects, by controlling for type of language and valence of behavior, defined as covariates in the model.

Results

Preliminary analyses. A main effect of gender was found for experienced pressure ($\beta = .07$, $t(99) = 2.07$, $p = .032$), but not for intentions to collaborate or felt closeness, indicating that women generally perceived sentences as more pressuring than men. No significant effects were found for the other sociodemographic variables (all $ps > .05$). Next, descriptive statistics and multilevel Pearson correlations were calculated at the between- and within-

person level. Table 2 displays the within-person correlations. Experienced pressure was related negatively to intentions to collaborate and felt closeness. In addition, intentions to collaborate was positively associated with felt closeness. Voice quality and amplitude were both positively related to experienced pressure, and negatively related to intent to collaborate and felt closeness, while duration was negatively related to experienced pressure and positively to intent to collaborate and felt closeness.

At the between-person level, a similar pattern of correlations was found between the three outcomes, with experienced pressure relating negatively to intentions to collaborate (r (109) = -.35, $p < .001$) and felt pressure (r (109) = -.50, $p < .001$) and intentions to collaborate relating positively to felt closeness (r (109) = .59, $p < .001$). Moreover, authoritarianism and a controlled orientation related negatively to experienced pressure (r(109) = -.29, $p < .001$; r(109) = -.23, $p = .02$), while an autonomous orientation related positively to intentions to collaborate (r(109) = .23, $p = .02$).

Primary analyses. Unconditional models to assess intraclass correlation (ICC) showed sufficient variability at the between-raters level for conducting full models (see Table 2). Table 3 presents the output of the linear mixed regression modelling for *Model 1* and *2* for the outcome variables experienced pressure, intent to collaborate, and felt closeness, respectively. For each outcome, *model 1* shows a large effect of prosody, such that sentences with a controlling prosody were perceived as more pressuring, and made listeners anticipate less intent to collaborate with and be close to the speaker than sentences spoken in an autonomy-supportive voice.

When investigating which precise acoustic parameter(s) accounted for the prosody effects, a main effect was observed for high-frequency energy, amplitude and duration on ratings of felt pressure (β = .46, t(6132) = 31.74, $p < .001$; β = -.12, t(6132) = -7.79, $p < .001$; β = -.20, t(6132) = -15.97, $p < .001$), collaboration (β = -.29, t(6132) = -21.03, $p < .001$; β =

.05, $t(6132) = 3.44$, $p < .01$; β = .12, t(6132) = 10.58, $p < .001$) and closeness (β = -.33, $t(6132) = -23.48$, $p < .001$; β = .08, $t(6132) = 5.55$, $p < .001$; β = .14, t(6132) = 12.21, $p < .001$), indicating that a harsher sounding, quieter, faster voice made listeners feel more pressured, anticipate less intent to collaborate and less willingness to be near the speaker. No significant effects of pitch were found (all *ps* > .05).

The multilevel mediation model indicates that experienced pressure serves as a mediator between manipulated prosody and collaboration and closeness. As can be noticed in Figure 1, manipulated prosody related positively to experienced pressure ($R^2 = .43$), which, in turn, related negatively to intent to collaborate ($R^2 = 53$) with and felt closeness ($R^2 = .59$) to the speaker. The direct effects between prosody and both intent to collaborate and felt closeness were no longer significant when introducing experienced pressure as the mediator (both *p*'s > .05), showing that controlling prosody reduces collaboration intents and closeness by eliciting pressure.

In the next step of the primary analyses, *Model 2* (see Table 3) shows that manipulated target impacted all three outcomes, with participants reporting more pressure, a lower intent to collaborate and less closeness to the speaker when sentences were directed to themselves compared to when they were directed at toddlers. Moreover, both authoritarianism and the controlled orientation related negatively to experienced pressure (β =-.09, $t(101) = -2.85$, $p = .01$; β = -.07, $t(101) = -2.37$, $p = .02$), but were unrelated to closeness and collaboration. Finally, the autonomous orientation related positively to intentions to collaborate (β = .13, $t(101) = 2.52$, $p = .01$).

Further, *Model 3* (see Table 3) showed a significant interaction effect between prosody and target, indicating that controlling prosody in particular was perceived as less pressuring (Figure 2A), more stimulative of collaboration (Figure 2B) and closeness (Figure 2C), when targeted at children as compared to adults. Simple slopes analyses demonstrated,

however, that controlling prosody was perceived as detrimental for adults and children alike, as a significant effect was found for all three outcomes regardless of the target of communication.

Next, we investigated cross-level interactions, with authoritarianism and causality orientations at the between-person level. *Model 4a* showed that authoritarianism interacted with prosody in the prediction of experienced pressure (β =-.03, $t(6134) = -3.34$, $p < .001$), intent to collaborate (β = .02, $t(6134) = 2.06$, $p = .04$) and felt closeness (β = .03, $t(6134) = 3.28$, $p < .001$). That is, parents scoring high on authoritarianism were less negatively impacted by controlling prosody. Effect sizes were small though, which is why no figures are plotted for these interactions. Moreover, significant simple slopes coefficients (all p's <.001) showed that although authoritarianism attenuated the costs associated with controlling prosody, it did not cancel out its main effect for people scoring low (1 standard deviation below the mean) or high (1 standard deviation above the mean) on authoritarianism for pressure ($\beta_{low} = 0.65$ and $\beta_{high} = 0.59$), intentions to collaborate ($\beta_{low} = -.44$ and $\beta_{high} = -.40$) and desired closeness ($\beta_{low} = -.49$ and $\beta_{high} = -.43$).

Model 4b showed that a similar pattern of significant interactions between prosody and the controlled orientation emerged for all outcomes. The controlled orientation attenuated the negative impact of controlling prosody compared to autonomy-supportive prosody. That is, controlling prosody was perceived as somewhat less pressuring (β = -.03, $t(6134) = -3.43$, $p = .02$) and was strongly negatively related to the intent to collaborate (β = .04, $t(6134) = 3.87$, $p < .001$) and the felt closeness with the speaker (β = .02, $t(6134) = 2.15$, $p = .03$) among individuals high on the controlled orientation. At the same time, simple slope analyses indicated the effect of prosody to still be significant (all p's <.001) among individuals scoring either low or high on the controlled orientation for pressure ($\beta_{low} = .65$ and $\beta_{high} = .59$),

intentions to collaborate (β_{low} = -.45 and β_{high} = -.38) and desired closeness (β_{low} = -.48 and β_{high} = -.43).

Fourth, *Model 4c* shows that participants' autonomous orientation systematically interacted with prosody in the prediction of perceived pressure (β = .10, $t(6134) = 11.22$, $p < .001$), intent to collaborate (β = -.09, $t(6134) = -9.30$, $p < .001$) and closeness (β = -.09, $t(6134) = -9.97$, $p < .001$). A reversed pattern of interactions was observed compared to the pattern noticed for authoritarianism and the controlled orientation. As shown in Figures 3A through 3C, the benefits of autonomy-supportive, relative to controlling, prosody were more outspoken among parents high on the autonomous orientation, with autonomy-supportive prosody being experienced as significantly less pressuring and more stimulative of collaboration and closeness. Parents low on the autonomous orientation, on the other hand, were somewhat less sensitive to the positive effects of autonomy-supportive as compared to controlling prosody.

Supplementary analyses. As was the case in Study 1, supplementary analyses were performed to confirm the robustness of the effect of prosody by entering sentence category and behavior as covariates. Results again confirmed that the effect of prosody remained significant on experienced pressure (β = .62, $t(6132) = 71.77$, $p < .001$), intentions to collaborate (β = -.41, $t(6132) = -44.73$, $p < .001$) and felt closeness (β = -.46, $t(6132) = -50.74$, $p < .001$) after controlling for the main effects of both the language the speaker used, or the valence of the behavior the speaker addressed. Commands were perceived as more pressuring (β = -.13, $t(6132) = -14.07$, $p < .001$), less stimulative of collaboration (β = .07, $t(6132) = 6.78$, $p < .001$) and closeness (β = .09, $t(6132) = 9.01$, $p < .001$) than statements as well as more pressuring (β = -.15, $t(6132) = -15.36$, $p < .001$), less stimulative of collaboration (β = .11, $t(6132) = 10.25$, $p < .001$) and closeness (β = .11, $t(6132) = 11.21$, $p < .001$) than suggestions. Sentences pointing towards undesired behavior were perceived as

more pressuring (β = .15, $t(6132) = 15.16$, $p < .001$), less stimulative of collaboration (β = -.09, $t(6132) = -9.02$, $p < .001$) and closeness (β = -.12, $t(6132) = -12.33$, $p < .001$) than sentences pointing towards desired behavior. Again, a two-way interaction effect was found for prosody and behavior, but not category, on pressure ratings, such that sentences spoken with a controlling voice were perceived as even more pressuring when pointing towards undesired behavior as compared to desired behavior (β = .04, $t(6133) = 3.35$, $p < .001$).

Brief Discussion

Findings of Study 2 replicated and extended those of Study 1 in several ways. Controlling prosody was not only found to be perceived as more pressuring than autonomy-supportive prosody, but it also made listeners less willing to collaborate with and want to take greater distance from the speaker. Mediational analyses further demonstrated that when a speakers' tone of voice is perceived as pressuring, this interferes with listeners' acceptance or internalization of the speaker's request for collaboration as well as listeners' desire to be near that speaker.

These effects appeared mostly driven by three acoustic features, that is, voice quality, amplitude, and duration, with voice quality yielding the strongest effect. Specifically, more energy was used in the higher frequency bands of a speaker's voice signal (i.e., energy band 1000-2000 Hz) or, said differently, the harshness of the tone of voice especially impacted the outcomes, with a lower volume and faster speech rate yielding supplementary, yet smaller effects.

Further, the effect of prosody appeared robust as the effects remained significant after controlling for the lexical-semantics of the conveyed message and were observed, regardless of whether the message was targeted to parents themselves or their children and regardless of parents' level of authoritarianisms and their habitual way of regulating their behavior (i.e., autonomy- or control-oriented). At the same time, we noted some evidence for moderation.

Specifically, parents anticipated that controlling prosody would have a somewhat less negative effect when it was directed to their toddlers as compared to themselves. Moreover, the anticipated costs associated with controlling prosody were somewhat lower for parents scoring high on either the controlled orientation or authoritarianism, whereas parents high on the autonomous orientation believed benefitting somewhat more from the positive effects of autonomy-supportive prosody.

General Discussion

In daily life, we sometimes feel reluctant to be cooperative with a speaker when we feel our freedom is being threatened by advice or guidelines (Brehm, 1966). We may even reject authority, do the opposite of what we are told or take physical distance from them in an attempt to show our dissatisfaction. What explains our disobedience has in many cases not to do with what the speaker said, but the tone with which the message was conveyed. Despite its everyday importance, the literature on motivational prosody is still in its infancy. The present set of studies aimed to contribute to this growing body of work by examining whether sentence-to-sentence variation in prosody and the specific acoustic parameters involved impacts sentence-to-sentence variation in anticipated pressure, closeness, and intentions to collaborate. We also sought to investigate the robustness of motivational prosody by examining whether its effect would stand after controlling for the lexical-semantics of the message and would be applicable across the target of communication (i.e., oneself or children) and individual differences in authoritarianism and causality orientations.

Fine-grained Insight in Controlling Prosody

Several key findings deserve being highlighted. First, a systematic effect of motivational prosody was found across both studies, with different acoustic profiles reflecting different motivational intents, leading to different responses in listeners. Keeping the lexical-semantics of the message constant, the meaning (Deci & Ryan, 1985b) attributed to the

message was found to vary as a function of how the message was expressed. That is, being spoken to with a controlling tone of voice, as compared to an autonomy-supportive one, made listeners feel more pressured, made them less willing to collaborate with the speaker and instead led them to take more distance from the speaker.

These findings are congruent with previous research (Paulmann & Weinstein, 2023; Weinstein et al., 2019, 2020), while also extending them by showing that listeners can easily pick up the variation in tone of voice as it changes from sentence to sentence. Indeed, multilevel analyses indicated that a large percentage of the variance (i.e.,73-91%) was situated at the within-person level, where the manipulation took place. Said differently, the brief exposure to a controlling and autonomy-supportive tone of voice (i.e., a single sentence) suffices to generate different experiences in listeners, and thus, that motivational tone of voice is picked up and differentiated quickly by listeners. These findings fit well with neurophysiological research showing that controlling and autonomy-supportive prosody are differentiated from each other within 200 ms after sentence onset (Paulmann et al., 2019), and that controlling tone of voice especially is picked up early on and leads to preferential, and more in-depth processing (Zougkou et al., 2017).

Second, the current research examined, for the first time, in a set of more fine-grained analyses which acoustic parameters were used by speakers to convey control and autonomy-support through the voice, and, which of those parameters yielded the strongest effects in listeners. In line with previous findings (Paulmann et al., 2017; Weinstein et al., 2018; 2020), voice quality was the most critical acoustic dimension in conveying control, with controlling speakers using a harsher tone of voice than autonomy-supportive speakers. Moreover, speakers used a louder voice to convey control, as was the case in most previous studies (Paulmann et al., 2017; 2018; Weinstein et al., 2018). Finally, no effects were found for duration and pitch. Past work also reported inconsistent findings for duration and pitch, with

studies reporting higher (Paulmann et al., 2017; Weinstein et al., 2018; 2020), lower (Weinstein et al., 2018; 2020) or non-significant (Paulmann et al., 2018) differences in pitch, and shorter (Weinstein et al., 2020), longer (Paulmann et al., 2017; 2018; Weinstein et al., 2018) or non-significant differences (Weinstein et al., 2018) in duration when communicating autonomy-supportive, relative to controlling, messages.

In a next step, we explored which acoustic cues would be most decisive in predicting listeners' felt pressure, intent to collaborate, and closeness. As hypothesized, voice quality especially, and to a lesser extent amplitude and duration, primarily affected the way listeners experienced a speaker's message. That is, especially harsher-sounding speakers, relative to softer-sounding speakers, were perceived as more pressuring, resulted in increased distance with the speaker and a reduced intent to collaborate with the speaker. Further, quieter and faster sounding speakers were experienced as more pressuring, making listeners anticipate less intent to collaborate with and want to be less close to the speaker.

Taken together, it seems that the quality of a speaker's voice is the most critical acoustic feature, both to convey control through the voice as well as in terms of its effect on listeners. Although other acoustic cues, like amplitude, duration or pitch, covary with voice quality, their role in affecting listeners seems less outspoken. One possibility is that the effect of duration, amplitude and pitch depends on whether these features get combined with a harsher or softer voice, an issue that can be explored in future research.

Third, mediational analyses in Study 2 indicated that experienced pressure almost fully explained why controlling prosody reduced participants' intention to collaborate and undermined their felt closeness to the speaker. Findings fit in well with psychological reactance theory (Brehm, 1966) and Self-Determination Theory (Ryan & Deci, 2017; Van Petegem et al., 2015), since a controlling tone of voice triggers a reactance response, as manifested through the inclination to take distance from the speaker and refuse to collaborate

with the speakers' request. Said differently, a controlling tone of voice hampers the process of internalization (e.g., low willingness to collaborate) and even comes with a connectedness blockage (e.g., low closeness the speaker). Moreover, findings are congruent with prior studies which found autonomy need satisfaction to account for the impact of controlling, relative to autonomy-supportive, language on participants' intrinsic motivation and persistence (Baten et al., 2020; Mabbe et al., 2018). Yet, rather than focusing on intrinsically motivating activities, the requests in the current study often involved rather boring activities that one would not spontaneously engage in. The findings confirm the broader claim within Self-Determination Theory that basic need experiences have explanatory power, thereby accounting even for minimal variations in the alterations of the social context (Vansteenkiste et al., 2020).

A fourth and final set of findings underscore the robust impact of prosody. The prosody effect held after controlling for the lexical-semantics of the delivered message, meaning that the tone of voice with which speakers communicate their message had a significant impact on listeners above and beyond the effect of the words speakers used. At the same time, findings indicate that the prosody and lexical-semantics of a message can reinforce each other, with requests that address undesired behavior, as compared to those addressing desired behavior, being perceived as especially pressuring when communicated with a controlling tone of voice. This mirrors effects from the emotional prosody literature where messages that convey emotions through both lexical-semantics and voice are easiest to recognize (e.g., Paulmann & Pell, 2010; Paulmann, Jessen, Kotz, 2012). Findings are also reminiscent of prior work on goal strivings, showing that athletes' pursuit of avoidance goals (i.e., self-imposed undesired behavior) for controlled reasons comes with the greatest level of threat and need frustration during the race (Delrue et al., 2016).

Role of Listener Characteristics and Targets' Age

Moreover, the prosody effect was only minimally different depending on the type of target and individual differences in authoritarianism and causality orientations. The robust main effect of controlling prosody was most salient. Despite significant interaction effects, controlling prosody was perceived as more pressuring, making listeners anticipate less intent to collaborate and be less close to the speaker than autonomy-supportive prosody. If moderation applied, the effects of a controlling tone of voice were somewhat downplayed or exaggerated, presumably depending on how normative listeners find this type of communication. Specifically, when targeted at children, controlling prosody was perceived as somewhat less detrimental. Because parents might find it more normative and, hence, legitimate to talk to children in controlling ways, they may estimate a controlling tone of voice as less harmful. Indeed, parents, as socializing agents, may see it as their task to help their children regulate their behavior, as well as to sanction them when they act inappropriately - a task in which a controlling communication style is sometimes seen as useful, normative, and effective, especially when compared with a more permissive style (Grusec & Davidov, 2010).

Alternatively, it could be that listeners in general care less about a speaker's voice when communication is not directed directly at them. For instance, this difference in perception could also reflect individuals' general self-serving bias, with people responding more negatively to threats to their own autonomy than when other people's autonomy is threatened (Campbell & Sedikides, 1999). Moreover, it is possible that parents' reactions would be different in case they were not asked to imagine being exposed to the materials, and anticipate their or their child's reactions, but would actually be exposed to a speaker addressing them with a controlling and autonomy-supportive tone of voice. Although well-controlled lab studies as the current one allow one to isolate critical factors and minimize contaminating factors, a limitation is that they come with somewhat lower ecological validity.

That is, in reality, participants are not asked to imagine being exposed to communications but are directly subjected to different tones of voices. Thus, the findings for toddlers may well reflect participants' biased perceptions, with the findings possibly being different in case they would see their child being exposed to a controlling socializing agent in reality. It will thus be important to test how participants react during real conversations and to monitor prosody effects on emotional and behavioral outcomes. Monitoring emotional outcomes may also help to control for effects due to emotional, and not motivational, reactions to the perceived tone of voice. Moreover, in the current study, participants listened to unfamiliar voices. More ecologically valid conditions may also offer insight into whether a personal bond with the speaker may moderate listener perceptions and responses.

Moreover, parents high on the controlled orientation seemed less sensitive to the negative effects of controlling as compared to autonomy-supportive prosody. This is in contrast to previous findings, which showed that the typically observed negative impact of rewards on intrinsic motivation (Deci et al., 1999) was on the contrary evident among control-oriented individuals only, with an autonomous orientation instead serving as a buffering factor against a reward-induced decline in intrinsic motivation (Hagger & Chatzisarantis, 2011). While we did not find evidence for such a buffering effect, which would have resulted in parents high on the autonomous orientation being less impacted by the negative effects of controlling prosody, we found that autonomy-supportive prosody seemed especially beneficial for parents high on the autonomous orientation, as they felt even less pressured, wanted to collaborate even more and felt even closer to the speaker in response to autonomy-supportive prosody. Such findings are in line with previous research that found an autonomy-supportive communication style to yield greater benefits for those growing up in more autonomy-supportive contexts (Van Petegem et al., 2017). In a similar fashion, when parents high on the autonomous orientation were spoken to with an autonomy-supportive

voice, they seemed especially sensitive for, or oriented towards the advantages of autonomy support (cf. Radel et al., 2011). In short, while control-oriented individuals seemed to suffer less from the negative impact of controlling prosody, autonomy-oriented individuals anticipated benefitting more from the positive impact of autonomy-supportive prosody. Further replication of these findings, as well as a further look into the dynamics underlying such processes is needed.

Finally, the effects of controlling prosody especially were perceived to be less detrimental by parents scoring high on authoritarianism, while those scoring low were more affected. Findings suggest that individuals who value obedience, conformity, and submission to authority are indeed less sensitive to, or less impacted by, the use of a controlling tone of voice, which is in line with previous research showing that people high on authoritarianism endorse more positive attitudes toward controlling parenting practices (Danso et al., 1997; Duckitt, 2001; Peterson et al., 1997).

Taken together, while controlling prosody is perceived to have more negative effects no matter the receiver of the message, findings suggest that parents for whom the use of a controlling tone of voice is a more common part of their discourse, or more normative practice, anticipated less impact of controlling prosody on toddlers or themselves. Whether these parents are less capable of discriminating between the nuances in motivational tone of voice or whether they are better capable of handling a controlling tone of voice is a topic for further investigation. One way of doing so would be to investigate whether listening to motivational tone of voice influences listeners' physiologically. Although the current studies have shown the differential effects on listeners' perception of the speakers' intent, and their self-reported reactions thereon, it is unclear whether these differences could also be found in listeners' physiological responses, as reflected in changes in heart rate variability, skin conductance or cortisol release, for instance. Such measures would also allow to investigate

mounting irritation, for instance, when being exposed to several controlling sentences in a row. Further research is thus needed to expand the current findings with more objective measures in response to controlling and autonomy-supportive prosody.

Limitations

While this study for the first time offered a fine-grained insight into the perception of motivational prosody, a few limitations need to be mentioned that can be addressed in future research. First, parents were asked to indicate how their toddlers would respond if they were spoken to in a controlling and autonomy-supportive tone of voice. This gives an insight into how adults feel about using controlling communication practices with children, but it does not allow us to draw any conclusions regarding the way children themselves react to such communications. There is some indication in the literature that children pick up motivational prosody differences at a young age (e.g., Gerson et al., 2019) and that they react differently to autonomy-supportive and controlling prosody from the age of 10 years old (e.g., Paulmann & Weinstein, 2023; Weinstein et al., 2019), but future studies with toddler or even infant populations would be useful. In doing so, it would be particularly exciting to examine whether children from parents who use controlling communications more frequently respond differently to harsh voices than children from parents who tend to use softer communications. Such an interaction effect would shed further light on the notion of normativity addressed herein.

Second, the current study used a within-subjects design because this approach allowed us to account for individual differences in listeners, for instance the tone of voice listeners are more habitually used to hear around them. Although the presentation of materials was counterbalanced, hearing the contrasting tone of voice may have artificially inflated the differences in prosody. Future research might want to pair within- and between-subjects

designs, which together offer a more conservative test of motivational tone of voice perception while controlling for individual differences in listeners.

Third, participants were presented with the stimuli targeting toddlers before the ones targeting participants themselves, without counterbalancing the order of presentation. While it is assumed that differences in perception are attributed to age differences in the listener, it might be that participants responded less negatively to controlling prosody when imaging being addressed themselves because they had heard the message once before, which may have reduced the impact of the controlling tone of voice. In this case, however, one might expect a similar pattern for autonomy-supportive prosody perception, which was not the case.

Finally, this study did not include a neutral tone control condition, making it difficult to interpret whether findings are due mostly to the amount of control or rather autonomy-support conveyed through the voice. Future research might want to include a neutral control group to answer this question with more certainty (see Paulmann & Weinstein, 2023; Paulmann et al., 2019; Weinstein et al., 2019).

Conclusion

The current set of experimental studies has shown that the tone of voice with which speakers convey their message, has an immediate impact on their listeners. Indeed, speaking with a harsher voice makes speakers sound more controlling, which makes listeners feel pressured, and therefore anticipate less intent to collaborate with or be near the speaker. Instead, when speaking with a softer voice, speakers sound more autonomy-supportive, because of which listeners feel less frustrated in their sense of autonomy. This, in turn, makes them anticipate more intent to collaborate with and be near the speaker. Although the effects of a controlling tone of voice were downplayed somewhat by listeners for whom the use of such a communication style is, presumably, a more common or normative practice, the main

effects appeared robust, with a controlling tone of voice leading to less favorable effects than an autonomy-supportive tone of voice across listeners.

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Table 1

Between-condition Comparison in Terms of Acoustic Indicators with Means (Standard Deviations) and Paired-Sample t-Statistics (Study 1)

Acoustic Indicator	Type of Prosody		t-test	*p*-value	η^2_p
	Autonomy-supportive	Controlling			
Pitch (in Hz)	170.03 (44.1)	171.35 (35.42)	0.46	.65	.00
Amplitude (in dB)	72.8 (3.61)	75.04 (2.53)	3.88	<.001	.13
Voice quality (in dB)	31.45 (3.97)	36.73 (2.97)	8.19	<.001	.40
Duration (in Sec)	1.41 (.41)	1.47 (.40)	0.39	.69	.00

Note: Speaker gender was controlled for. η^2_p denotes partial eta squared. T-test values are associated with the beta coefficient of the prosody effect in the linear regression models.

Table 2

Descriptive Statistics and Within-Person Pearson Correlations (Study 2)

	M	*SD*	ICC	1.	2.	3.	4.	5.	6.
Acoustic indicators									
1. Pitch	170.63	38.81	.87						
2. Voice quality	34.37	4.26	.07	.02*					
3. Amplitude	74.00	3.36	.09	.09**	.56***				
4. Duration	1.47	0.40	.00	.20***	.06***	-.25***			
Outcomes									
5. Experienced pressure	1.09	3.11	.09	-.01	. 38***	.20***	.13***		
6. Intended collaboration	3.75	1.52	.27	.01	-.28***	-.17***	.10***	-.73***	
7. Felt closeness	3.23	1.50	.25	.01	-.30***	-.16***	.10***	.77***	.80***

Note: ***p<.001, **p<.01, *p<.05; M = mean, SD= Standard Deviation, ICC = intraclass-correlation.

Table 3

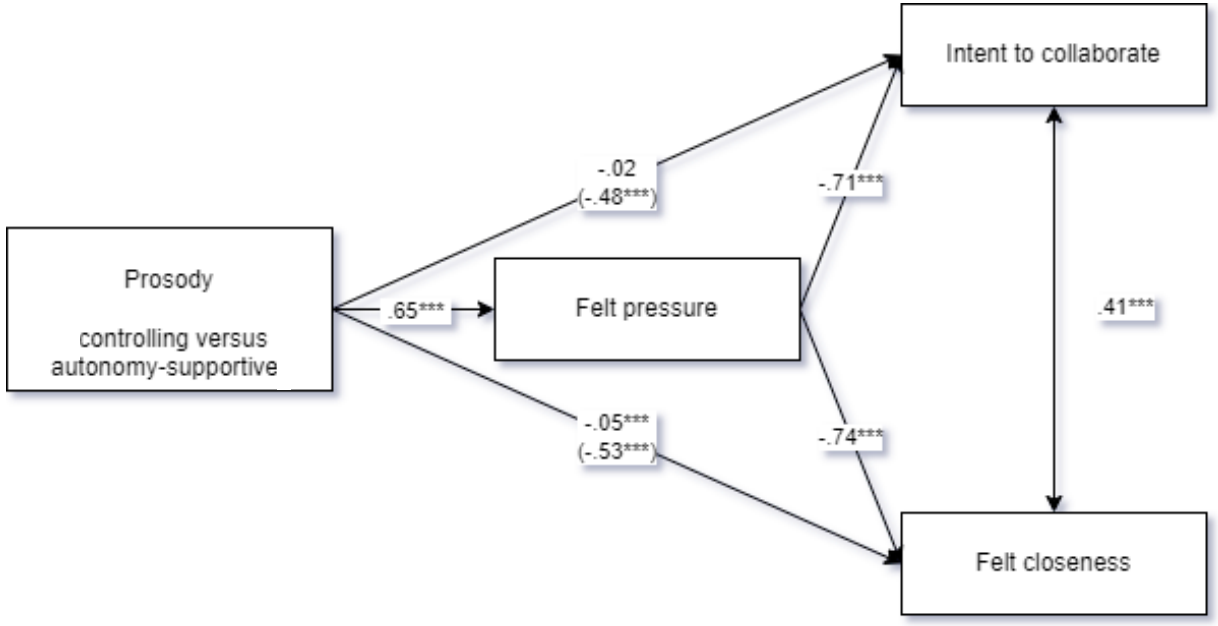
Results of Linear Mixed Regression Modeling for all Three Outcomes (Study 2)

	Experienced Pressure			Intent to Collaborate			Felt Closeness		
	1	2	3	1	2	3	1	2	3
Fixed Effects									
Within-subject predictors									
Prosody[controlling]	.62***(.43)	.62*** (.43)	.60***(.35)	.41***(.24)	-.41*** (.24)	-.39***(.19)	-.46***(.28)	-.46*** (.29)	-.44***(.19)
Target[adult]	--	.07*** (.00)	.07***(.00)	--	-.07*** (.00)	-.07***(.00)	--	-.09*** (.02)	-.09**(.00)
Prosody*Target	--	--	.05***(.00)	--	--	-.04***(.00)	--	--	-.03**(.00)
Between-subject covariates									
Gender	.06^{+} (.04)	.05^{+} (.03)	06^{+} (.04)	-.06 (.01)	-.08 (.02)	-.06 (.01)	-.11* (.04)	-.11* (.05)	-.11* (.01)
Random Effects									
$\sigma_{Individual}$	.95	.95	.95	.79	.78	.79	.74	.73	.79
$\sigma_{Residual}$	2.24	2.24	2.23	1.13	1.13	1.13	1.10	1.11	1.13
Model specifications									
Max VIF	--	1.11	1.25	--	1.11	1.25	--	1.09	1.25
R^2 marginal	.39	.40	.39	.17	.19	.18	.22	.24	.23
R^2 conditional	.48	.49	.49	.45	.45	.45	.46	.47	.47

Note. ***p<.001, **p<.01, *p<.05; Numbers are standardized coefficients with partial eta squared between brackets.

Figure 1

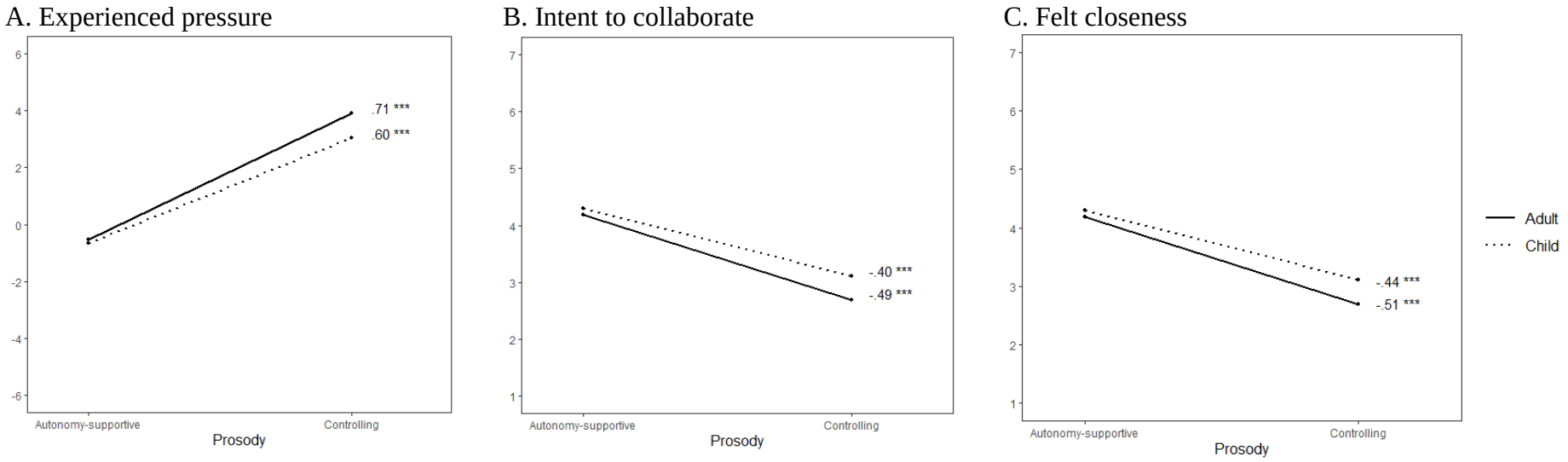
Multilevel Mediation Model with Controlling as Compared to Autonomy-Supportive Prosody Relating to Differences in Felt Closeness and Intention to Collaborate via Experienced Pressure



Note: Saturated model with standardized coefficients being calculated at the within-subject level. The between-subject level was controlled for. All standardized coefficients are significant at $p < .001$***. Numbers between brackets are total effects.

Figure 2

Visualizations of Two-way Interactions Between Prosody and Target in Prediction of Study Variables With Simple Slope Coefficients

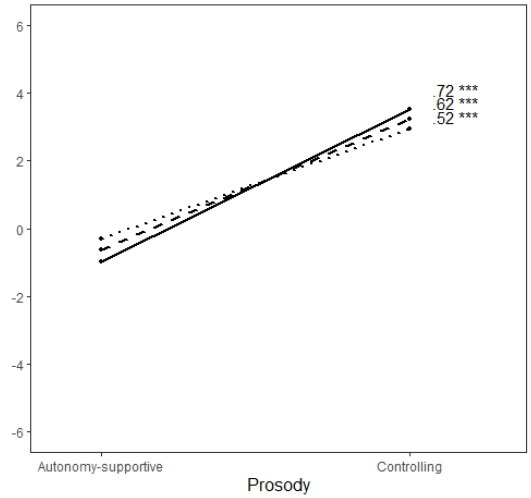


Note. ***p <.001.

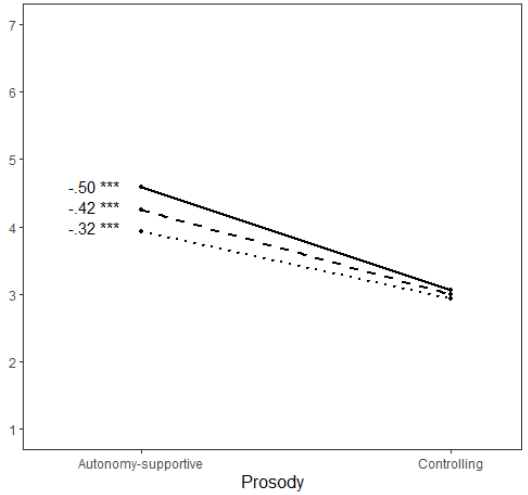
Figure 3

Visualizations of Two-way Interactions Between Prosody and Autonomous Orientation in Prediction of Study Variables With Simple Slope Coefficients.

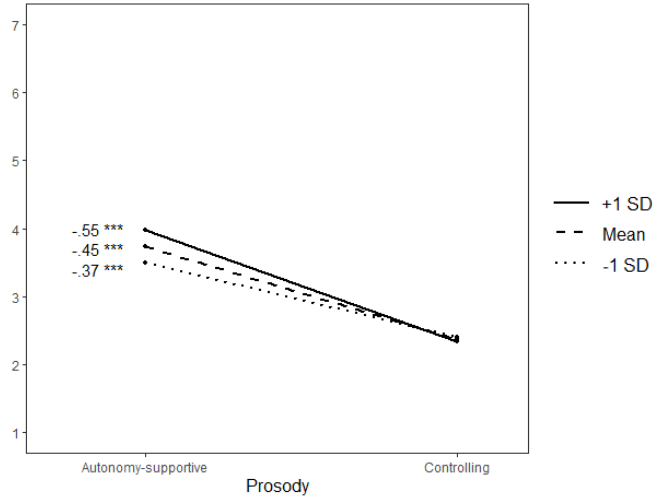
A. Experienced pressure



B. Intent to collaborate



C. Felt closeness



Note. ***p <.001

Appendix A

List of Stimuli Intoned by Actors

Table A1

Sentences Intoned by Actors With Type of Language, Valence of Behavior and Target Specified

Sentence	Type of Sentence	Valence of Behaviour	Target
Luister eens naar mij. (Listen to me.)	Command	Desired	Child/Parent
Laat dat niet meer gebeuren. (Let's not have that happen again.)	Command	Undesired	Child/Parent
Dat is niet oké. (That is not okay.)	Statement	Undesired	Child/Parent
Stop daarmee. (Stop that.)	Command	Undesired	Child/Parent
Ik heb niet graag dat je dat doet. (I don't like you doing that.)	Statement	Undesired	Child/Parent
Laat me de regels herhalen. (Let me remind you of the rules.)	Command	Desired	Child/Parent
Nu moeten we je haar wassen. (Now we have to wash your hair.)	Statement	Desired	Child
Je ziet er goed uit zonder gel. (You look good without gel.	Statement	Desired	Child
Laten we die gel eruit halen. (Let's get that gel out.)	Suggestion	Desired	Child
Waarom gaan we je niet even opfrissen. (Why don't we get you cleaned up.)	Suggestion	Desired	Child
Laat me dat uitkammen. (Let me comb that out.)	Command	Desired	Child
Doe dat busje gel weg. (Put away that gel bottle.)	Command	Undesired	Child
Geen koekjes meer voor jou vandaag. (No more biscuits for you today.)	Statement	Undesired	Child
Een stuk fruit is ook lekker. (A piece of fruit is tasty as well.)	Statement	Desired	Child
Laat ons een banaan pellen. (Let's peel a banana.)	Suggestion	Desired	Child
Als je nu eens fruit zou eten. (How about you eat some fruit.)	Suggestion	Desired	Child
Neem in plaats daarvan een stuk fruit.	Command	Desired	Child

(Take a piece of fruit instead.) Leg die koekjes weg. (Put these biscuits away.)	Command	Desired	Child
Elk kind verdient een snack. (Every child deserves a snack.)	Statement	Desired	Child
Die snack is niet van jou. (That snack doesn't belong to you.)	Statement	Undesired	Child
Laten we zijn snack teruggeven. (Let's give that snack back.)	Suggestion	Desired	Child
Als we nu eens elk onze eigen snack opeten. (Why don't we each have our own snack.)	Suggestion	Desired	Child
Pak de spullen van anderen niet af. (Don't take other children's stuff.)	Command	Undesired	Child
Eet je eigen snack. (Eat your own snack.)	Command	Desired	Child

Appendix B

Supplementary Analyses for Study 1

Table B1

Results of Linear Mixed Regression Modeling With Standardized Coefficients (and Partial Eta Squares) for Bossiness and Felt Choice as Predicted by Prosody for Study 1

Variable	Bossiness	Felt choice
Prosody	.59*** (.40)	-.37*** (.17)
Gender	.05 (.01)	.04 (.01)

Note. ***p <.001, **p< .01, *p< .05.

Table B2

Results of Linear Mixed Regression Modeling With Standardized Coefficients (and Partial Eta Squares) for Bossiness and Felt Choice as Predicted by Acoustic Parameters for Study 1

Variable	Bossiness	Felt choice
Pitch	.10* (.00)	-.06 (00)
Voice quality	.42*** (.13)	-.25*** (.04)
Amplitude	-.11*** (.00)	.08*** (.00)
Duration	-.13*** (.02)	.15*** (.02)
Gender	.04 (.00)	.05 (.00)

Note. ***p <.001, **p <.01, *p <.05.

Appendix C

Supplementary Analyses for Study 2

Table C1

Results of Linear Mixed Regression Modeling With Standardized Coefficients (and Partial Eta Squares) for Bossiness for Study 2

	Felt pressure		Felt choice	
	1	2	1	2
Fixed Effects				
Within-subject predictors				
Condition[controlling]	.65*** (.47)	.62*** (.40)	-.44*** (.23)	-.43***(.17)
Target[adult]	--	.04*** (.00)	--	-.08***(.00)
Condition *Target	--	.07*** (.00)	--	-.02 (.00)
Between-subject predictors				
Gender[female]	.04 (.02)	.04 (.02)	-.08+ (.04)	-.08+ (.04)
Random Effects				
$\sigma_{Individual}$	.58	.58	.59	.59
$\sigma_{Residual}$	1.33	1.33	1.26	1.26
Model specifications				
Max VIF	--	1.25	--	1.25
R^2 marginal	.43	.43	.20	.20
R^2 conditional	.52	.52	.34	.34

Note. ***p<.001, **p<.01, *p<.05.

Table C2

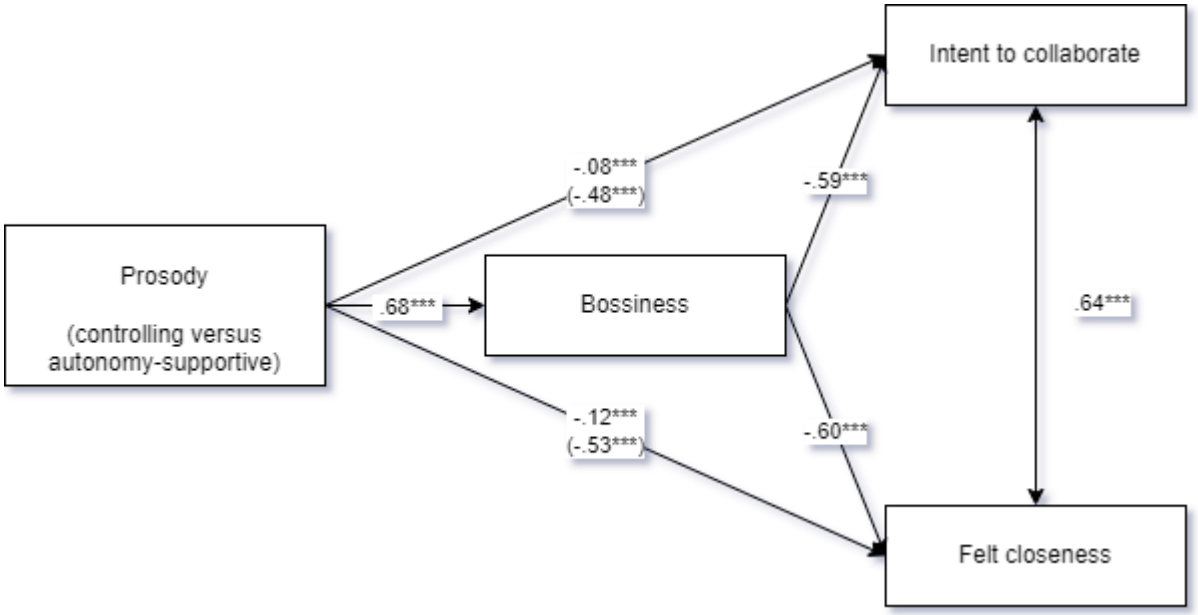
Results of Linear Mixed Regression Modeling With Standardized Coefficients (and Partial Eta Squares) for Bossiness and Felt Choice as Predicted by Acoustic Indicators for Study 1

Variable	Bossiness	Felt choice
Pitch	-.01 (.00)	.01 (00)
Voice quality	.49*** (.16)	-.32*** (.07)
Amplitude	-.12*** (.01)	.09*** (.00)
Duration	-.18*** (.03)	.17*** (.03)
Gender	.16*** (.04)	-.16*** (.04)

Note. ***p <.001, **p <.01, *p <.05.

Figure C1

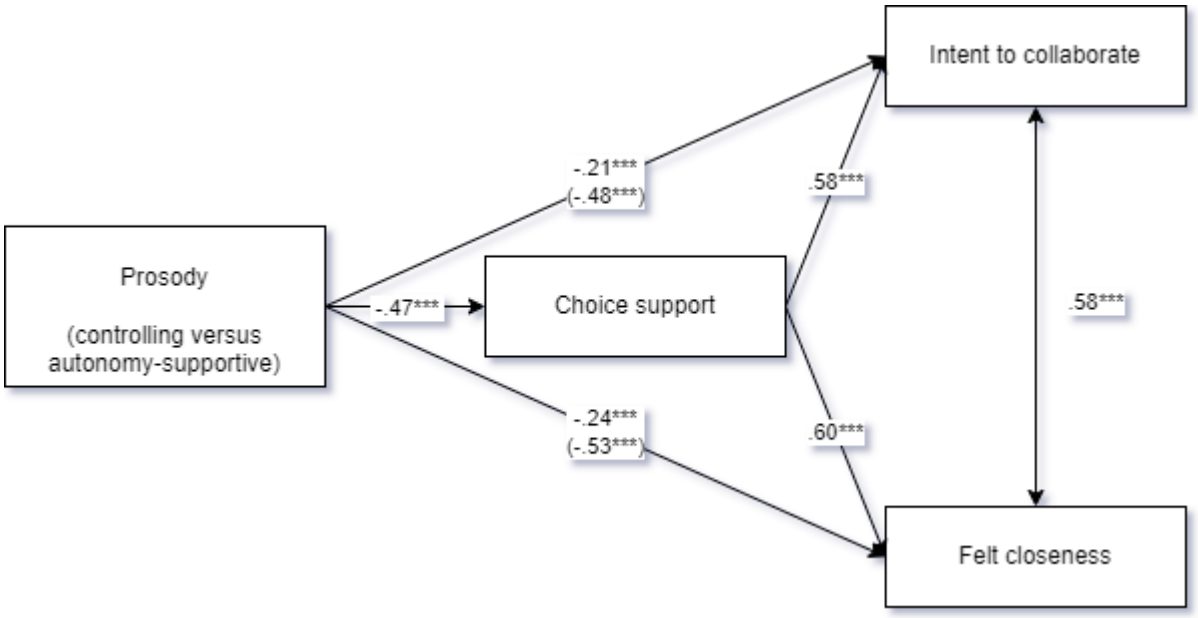
Multilevel Mediation Model With Autonomy-Supportive as Compared to Controlling Prosody Relating to Differences in Felt Closeness and Intention to Collaborate via Bossiness.



Note: Saturated model with standardized coefficients being calculated at the within-subject level. The between-subject level was controlled for. All standardized coefficients are significant at $p < .001$***. Numbers between brackets are total effects.

Figure C2

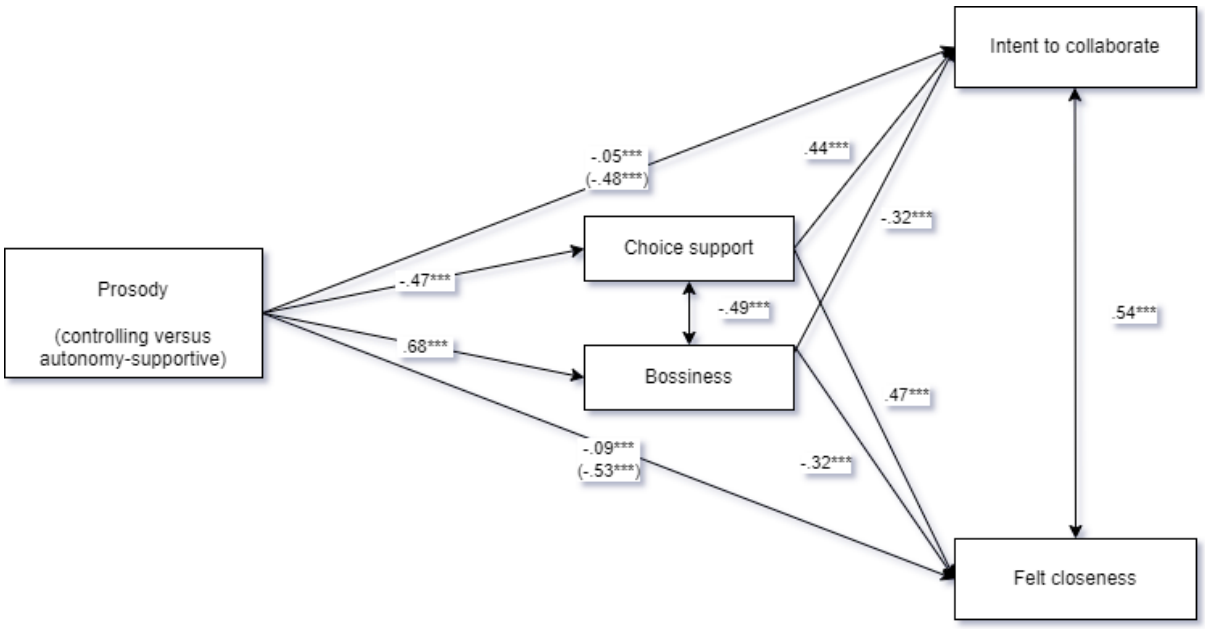
Multilevel Mediation Model With Autonomy-Supportive as Compared to Controlling Prosody Relating to Differences in Felt Closeness and Intention to Collaborate via Choice Support.



Note: Saturated model with standardized coefficients being calculated at the within-subject level. The between-subject level was controlled for. All standardized coefficients are significant at $p < .001$***. Numbers between brackets are total effects.

Figure C3

Multilevel Mediation Model with Autonomy-Supportive as Compared to Controlling Prosody Relating to Differences in Felt Closeness and Intention to Collaborate via Choice Support and Bossiness.



Note: Saturated model with standardized coefficients being calculated at the within-subject level. The between-subject level was controlled for. All standardized coefficients are significant at $p < .001$***. Numbers between brackets are total effects.